Optimizing Space Exploration through International Cooperation

Briefing to the
Mars Strategic Roadmap Committee
Washington, DC
February 8, 2005

Peggy Finarelli
International Space University

Ian Pryke
George Mason University

Acknowledgement

This presentation and the accompanying paper are based on discussions that took place in the Working Group on "International Cooperation in the Context of a Space Exploration Vision" at the 7th AIAA Workshop on International Space Cooperation held in Anchorage, Alaska, May 3-6, 2004.

We thank the other members of the Working Group for their contributions, which made this current work possible.

Working Group Mandate

In announcing his Vision for space exploration, US President Bush stated that *"We'll invite other nations to share the challenge and the opportunities of this new era of discovery."* Having characterized the Vision as *"a journey, not a race,"* he then called on "*other nations to join us on this journey, in a spirit of cooperation and friendship."* Other nations also have specific exploration missions or comprehensive exploration agendas (e.g., ESA's Aurora program) as an integral part of their overall space strategies. Based on this background, the Working Group provided an independent forum in which **to discuss the modalities of defining and implementing an exploration vision as a coordinated international endeavor**.

US-European Cooperation: Compatible Motivations

- Emerging US and ESA initiatives triggered by similar fundamental motivations and challenges
  - History of exploration is fundamental to American and European cultures
  - Need a mandate for human spaceflight in the post-ISS era, especially after the loss of Columbia
- On the US side: Desire for less interdependence
- On the European side: Capabilities for greater independence; desire for less asymmetry/more equal footing (especially in robotic missions)

US-European Cooperation: Common Fundamental Approaches

From the U.S. Presidential Vision	*From ESA's Aurora Program*
Return to the Moon to enable future exploration of Mars	Mars, with return to the Moon in the meantime
A long-term human and robotic program to explore the Solar System	Robotic and human exploration of the solar system
A journey not a race, with other nations invited to join	A worldwide endeavor not for any one nation alone
Advance U.S. scientific, security and economic interests	Space remains a highly strategic asset in industrial, political, technological and economic terms
No large budget increase	An affordable objective

Prospects for International Cooperation

- Currently emerging US and ESA programs similar in form and objective
- Other Nations
  - Detailed assessment of other nations' programs not conducted by Anchorage Working Group
  - Moon/Mars exploration: Canada, China, India, Japan, Russia
  - Human spaceflight: China, Russia
- There is momentum for launching a world-wide cooperative venture, especially if the US and Europe choose to cooperate

Consider This . . .

President Reagan directed NASA in January 1984 to develop a permanently manned space station and invited the nation's Cold War "friends and allies" to join the program to "strengthen peace . . . and expand freedom . . . for all who share our goals." In 1988, agreements with Europe, Japan and Canada were concluded. After the fall of the Soviet Union, in 1993, President Clinton invited Russia to join the partnership, with agreements bringing Russia into the partnership being signed in 1998.

"By [2000], the Station had evolved from a Cold War demonstration of US leadership, alliance solidarity and technological might, into an icon of post-Cold War cooperation with the new Russia."

ISU 2002 Symposium
Paper by Cline, Finarelli, Gibbs & Pryke

Need for a New Paradigm

- Broad international involvement desirable from early stages for political, financial and scientific & technological reasons
- Traditional approach to international cooperation: Negotiation of roles and responsibilities of all partners at the outset
- Moon/Mars visions provide for a long-term, open-ended set of activities impossible to predict in detail at this early stage
  - Traditional approach is virtually impossible

New Paradigm for International Cooperation

- All national space exploration activities ("Programs"), taken together, comprise an inherently global enterprise for exploration (a "Virtual Program")

A "Virtual Program of Programs"

- Communication, consultation and coordination to maximize effectiveness of totality of national exploration activities

An "International Space Exploration Coordination Council"

International Space Exploration Coordination Council - Basics

- Scope:
  - Moon, Mars & Beyond-related robotic and human exploration
- Task:
  - Provide a forum for communication, consultation, coordination
    - Non-binding, no control functions
- Purpose:
  - Optimize global effort
  - Promote sustainability and continuity through changes in national commitments

International Space Exploration Coordination Council - Membership

- Membership open to any nation actually conducting space exploration
  - Members must be committed to the "Virtual Program of Programs" and willing to share information on their national activities and plans
- Separate wider consultation activity needed to engage new parties as capabilities and interests evolve over time

International Space Exploration Coordination Council - Functions

- Exchange information
- Promote vision convergence and updating
- Discuss virtual architecture for mutual benefit
  - Minimize gaps and overlaps
  - Enhance critical path redundancies
- Develop implementation support mechanisms
  - Standardization, interoperability, compatibility (e.g. technical interfaces, data formats, etc.)
- Enhance S&T community networks

International Space Exploration Coordination Council - Process

- The process should be developed by the Council's stakeholders
- Regular meetings at level of national agency leadership
  - Avoid the pitfalls of a mere "talking shop"
- Provide proper support to promote focus and continuity
  - But beware the growth of bureaucracy

Exploration Programs

- Utilize a spectrum of mechanisms (some cooperative, some not) to conduct individual projects, choosing the approach that fits tasks and circumstances of each individual project :
  - Single agency projects (still part of international "Virtual Program")
  - Bilateral and multilateral cooperation in specific projects
  - More asymmetry in human programs; less in robotic programs
- Select specific partners for each project depending on interests and capabilities

Examples of International Cooperation Tools

Tools	Examples
Coordination of national projects	Halley missions, CEOS, COSPAS/SARSAT, GEOSS
Program enhancement	Space Station Freedom
Intra-program interdependence	ISS, Hubble, ISS, Cassini-Huygens
Government-agreed foreign industrial participation	Italian Multi-Purpose Logistics Modules for ISS
Joint teaming	X-38 CRV
Government-enabled industrial teaming	Joint Strike Fighter
International joint ventures	Intl Launch Services, Sea Launch
International organizations	ESA, EUMETSAT, Intelsat

Coordinated unilateral projects can be part of the international effort

And . . . First Steps?

- NASA International Workshop
  - "Creating New and Sustainable Space Exploration"
  - November 16-18, 2004, Washington, DC
  - 19 space organizations present
    - All ISS partners
    - Plus Argentina, Australia, China, Hungary, India, Israel, Korea, Ukraine

NASA International Workshop Intl. Collaboration Group "Report-Out"

- A shared international vision for space exploration is desirable in the long term
- Creation of an international coordination mechanism should be considered to provide a framework for ongoing dialogue
- A single cooperative approach for all projects is not appropriate
  - Different management structures and instruments of cooperation would be used depending on character of specific project
  - Each project could have different cooperative partners and different kinds of contributions and returns
- Pursuit of technical standards or interoperability holds promise and can be pursued in the near term.

"Virtual Program of Programs" Follow-On Workshop

- Follow-on international workshop to look at implementation/operation
  - April 19-22, 2005
  - Hosted by ISU in Strasbourg, France
  - Organized in conjunction with GMU
  - Co-sponsored by AIAA, AAS, IAF and IAA
  - Supported by a grant from the Raytheon Company
- Potential additional international workshops
  - Outreach (Fall '05) & Legal Regime (Spring '06)